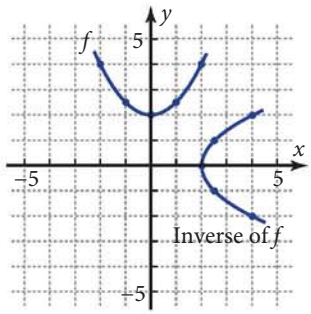

Figure 1-5e

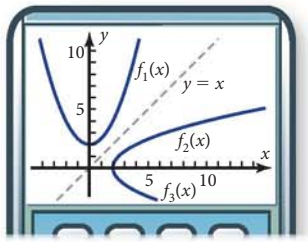

Figure 1-5f

b. Figure 1-5e shows the graphs of function f and its inverse relation. The inverse relation is not a function because there are two values of y for each value of $x > 2$. The inverse relation fails the vertical line test.

c. Function: $y = 0.5x^2 + 2$ — Use y for $f(x)$.

Inverse: $x = 0.5y^2 + 2$ — Interchange x and y.

$y^2 = 2x - 4$

$y = \pm\sqrt{2x - 4}$ — Take the square root of both sides.

$f_1(x) = 0.5x^2 + 2$ — Enter $f(x)$ as $f_1(x)$.

$f_2(x) = \sqrt{(2x - 4)}$

$f_3(x) = -\sqrt{(2x - 4)}$ — Enter the two branches of the inverse relation as $f_2(x)$ and $f_3(x)$.

$f_4(x) = x$ — Enter $y = x$ as $f_4(x)$.

Figure 1-5f shows the graphs of function f and its inverse relation. The graphs are reflections of each other across the line $y = x$. ◀

Parametric Equations

There is a simple way to plot the graph of the inverse of a function with the help of **parametric equations.** Here, x and y are both expressed in terms of some third variable, usually t (because time is often the independent variable in real-world applications).

In this exploration, you will see how to graph a relation specified by parametric equations, both by hand and on your grapher.

EXPLORATION 1-5: Parametric Equations Graph

Let x and y be functions of a third variable, t, as specified by these equations:

$$x = t^2 + 1$$
$$y = t + 2$$

1. Make a table of values of t, x, and y for each integer value of t from -3 to 3.
2. On graph paper, plot the points you found in Problem 1. Connect the points with a smooth curve in the order of increasing values of t.
3. For the relation you plotted in Problem 2, is y a function of x? Explain.
4. Set your grapher to parametric mode. Enter the two equations. Use a window with $-3 \le t \le 3$ and a t-step of 0.1. Set $-10 \le x \le 10$ and $-6 \le y \le 6$. Then plot the graph. Does your grapher's graph agree with your pencil-and-paper graph? If not, make changes until the two graphs agree.
5. What did you learn as a result of doing this exploration that you did not know before?